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REPORT

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INFORMATION REPORT

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The research and development plan appropriation for 1953, allotted to the Electrochemical Combine Bitterfeld, Germany (Elektrochemisches Kombinat Bitterfeld, VEB) was 4,329,000 DME. Dr. E. Bauer was the official in charge of the research and development. Project breakdowns, with individual appropriations, were as follows:

1. Development of selected methods for the production of sodium chlorite on a laboratory scale. The purpose of this work is to reproduce the most important methods of production of sodium chlorite from sodium chlorate so that a comparison of the technical and economic possibilities can be undertaken. Also, the basis for a semi-technical trial installation will be prepared. Appropriation: 70,000 DME.
2. Development of a method for the separation of technically pure cerium oxide from Kola apatite as well as the separation of rare earths. In 1953 a factory will be erected in Bitterfeld for the production of 100,000 metric tons of "Nitrophos" 2/ per year, requiring 35,000 metric tons of Kola apatite as raw material. In the preliminary neutralization a slime separates out which contains cerium oxide; about 100 metric tons of cerium oxide are obtained by this method in a year. A new project has been initiated, the purpose of which is to find a laboratory-scale method for obtaining technically pure cerium oxide and fluoride (for the production of cerium mixed-metal) and for the separation of cerium, lanthanum, praseodymium and neodymium. Appropriation: 80,000 DME.
3. Research on the production of metallic titanium from titanium tetrachloride; a reproduction of the Kroll method for the reduction of titanium tetrachloride vapor with liquid magnesium; research on the separation of titanium through molten electrolysis. Appropriation: 100,000 DME.
4. Production of iron powder and iron alloy powders with high magnetic characteristics; exhaustive research on optimal methods for production of soft magnetic iron powder from iron oxalate and formate, the development of which was completed in 1952; new procedures for the production of alloys and of powders with new characteristics which would be significant in coil production in the electronics industry. Appropriation: 120,000 DME.
5. Investigations of slag equilibria in the aluminothermic thermite- or Goldschmidt-type process; production of ferro-alloys; investigation of the

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equilibrium between metal and slag in the molten mass to determine the optimal reaction conditions for the production of ferro-tungsten, -molybdenum, and -titanium. Appropriation: 70,000 DME.

6. Development of welding electrodes and their [flux] coatings for the welding of light metals; further development of the lithium-free coating for arc welding; creation of a production basis for the manufacture of welding electrodes for aluminum and aluminum-magnesium alloys; determination of the mechanical strength and a reduction of the hygroscopic properties of the coating; testing, for tear and binding strength, of welded joints produced with these electrodes and also for elastic limit and elongation. Appropriation: 60,000 DME.
7. Improvement of the physical properties of light metal alloys with a low content of critical materials; development of high strength aluminum piston alloys with low critical metal content; development of brass substitutes from strong, easily machinable aluminum alloys with good forming properties; high strength casting and extrusion alloys of the aluminum-magnesium-copper and aluminum-magnesium-silico-copper types; development of aluminum and magnesium alloys with a low tendency toward coarse grain formation. Appropriation: 180,000 DME.
8. Development of lead bearing-metals containing magnesium for high stress; development of lead bearing-metals, free of critical metals, for high and variable stresses, to be produced with alkali and alkali-earth metal additions, employing tin and antimony as hardening components; investigation of the pouring, running and corrosion properties of the developed lead bearing-metals; investigation of the influences of heat treatment on the initial hardness and retention of hardness of the bearing casting; production of thin cast bearings by centrifugal and head casting methods. Appropriation: 50,000 DME.
9. Development of production methods of high strength cast iron through the chlorination of molten cast iron prior to pouring; generation of spheroidal graphite (Kugelgrafit) in cast iron through degasification, and in particular, by chlorination of the molten state; chemical, metallographic and strength investigations as well as translation of the research results into practice. Appropriation: 90,000 DME.
10. Research on production of fluorovinyl compounds and polymers with maximum value and new plastic material properties; research on production of fluorine-containing vinyl monomers through the utilization of hydrogen fluoride and fluorine itself. These will be transformed into high stability plastics for the manufacture of insulation foils, packing material for valves and glands and the like, by modern high pressure polymerization techniques. Appropriation: 150,000 DME.
11. Development of new polymerization methods for purest polyvinyl chloride and other chlorovinyl compounds of the highest purity; testing of new catalysts and dispersing agents for improvement of the known polymerisates with the exclusion of electrolytes and replacements for peroxide catalysts, which, up to now, have been partially included in emulsion polymerization; obtaining purest PVC-polymerisates with the highest mechanical, electrical and corrosion-resistant properties. Appropriation: 150,000 DME.
12. Chlorination studies with vinyl chloride polymerisates to complete chlorine saturation; the highest possible replacement of hydrogen atoms with chlorine; production of new types of polymerisates with improved heat and light stability; investigation of thorough chlorination of PVC to saturation with excess chlorine under pressure, with and without the application of catalysts; creation of cheaper, producible PVC plastics with properties comparable with those of Teflon and Hostaflex. Appropriation: 60,000 DME.
13. Development of a method for the pressure chlorination of "polyvinyl chloride SP" in methylene chloride to a finished stock solution; simplification of the process, heretofore technically accomplished, for the chlorination in tetrachlorethane without the isolation of the post-chlorinated PVC; utilisation

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of methylene chloride in a process to give film-, lacquer-, and eventually, spinning-solutions for fibers/. PVC produced according to the suspension method will be chlorinated in methylene chloride under pressure in such a way that the chlorine content will be between 63-64 percent. Appropriation: 30,000 DME.

14. Mixed polymerization of vinyl chloride with halogenated alkenes; application of a new pearl (Perl) polymerization method for the manufacture of mixed polymerizates out of vinyl chloride and halogenated alkenes (asymmetric dichloroethylenes, trichloroethylenes, perchloroethylenes). The polymerization should be accomplished under very high pressure in order to produce plastics with new, interesting properties. Appropriation: 70,000 DME.
15. Further development of new plasticizers for PVC with a dicarboxylic acid basis; manufacture of plasticizers for PVC with improved cold stability and better direct current strength of PVC insulation materials; manufacture of dicarboxylic acid esters which are technically readily accessible. The esterification occurs with alcohols of the fatty acid series. Appropriation: 60,000 DME.
16. Further development of new stabilizers with improved properties; development of stabilizers of pure inorganic and pure organic origin in order to improve heat stability, light fastness, and UV sensitivity with manufactured plastics. Inorganic and organic metal compounds and organic amino acids will be mixed with PVC and tested for heat stability with reference to the splitting out of hydrochloric acid. The PVC foils will be tested for light fastness, UV insensitivity and transparency. Appropriation: 40,000 DME.
17. Research on the cracking of tars as well as processing the resulting products into chlorinated derivatives. The cracking studies are intended to lead to the production of the largest number of low molecular weight alkenes and alkanes. Through chlorination of these, a new raw material basis shall be created for several valuable plastics and a series of solvents. This should also lead to a saving of coke and electrical energy as well as a probable reduction in product cost. Appropriation: 100,000 DME.
18. Predominantly tetrachlorethylene along with carbon tetrachloride out of methyl chloride and chlorine. At the present time, the manufacture of tetrachlorethylene stems from carbide for which coke and much electrical energy is required. Through the production of tetrachlorethylene from methyl chloride, these energy forms will be saved. The probability also exists that large quantities of methyl chloride will be released as a by-product of the manufacture of terylene fibers and no apparent outlet exists for this by-product. Tetrachlorethylene is an excellent solvent and through the new method of manufacture, the cost of production will be lowered. Appropriation: 30,000 DME.
19. Laboratory research on the improvement of the method of manufacture of pentachlorophenol out of wastes from the manufacture of hexachlorocyclohexane should lead to ultimate reduction in the cost of hexachlorocyclohexane. Pentachlorophenol is urgently needed in the DDR as a wood preservative. A continuous three-step process is planned for the experimental installation. Simultaneously with the simplification and reduction in the cost of operation studies, biological testing of the products will be performed. Appropriation: 50,000 DME.
20. Manufacture of trichlorostyrene out of wastes from the production of hexachlorocyclohexane should convert a currently worthless by-product to a valuable polymerization product or a mixed polymerizate. The laboratory research should proceed to the development of a basis for a semi-technical research installation in the year 1953. Appropriation: 60,000 DME.

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21. Development of polarographic methods for the rapid determination of trace metal contents such as contaminants in aluminum and magnesium alloys and lead, mercury and chromium in blood (personnel health examinations). Appropriation: 13,000 DME.
22. Research on oxide catalysts for ammonia oxidation including cobalt and other oxide catalysts with effects similar to platinum catalysts; research on the internal structures and the eventual transformation of the catalytic substances; electron microscope studies; determination of yield in the laboratory with various experimental catalysts; plant studies with technical reactors using new catalysts. A portion of this work will be done by Prof. Guenther Riessacker of Hoesch. Appropriation: 72,000 DME.
23. The influence of the contaminants iron, silicon, zinc and magnesium on the chemical polishing of light metals will be studied. Laboratory experiments will be initiated with the largest variety of alloys and the polishes will be attained by treatment of the metals with various chemical agents and eventually by electrolytic treatment. Ultimately, both steps will be applied together. Appropriation: 16,000 DME.
24. Studies will be conducted on the improvement of the selective weed-killing agents "Sprithernit" and "Staube-Hormin" in addition to extension of their applications and the testing of other hormone-like, effective agents. The suspension properties and the reduction of the dissociation of the "Staube-Hormin," through the addition of suitable binders, will be studied in order to avoid injury of neighboring fields through air-borne dispersions. Furthermore, the annihilation of monocotyledonous weeds and weeds in the germination stage, by means of related and similar hormone-like effective agents, will be studied. Appropriation: 25,000 DME.
25. Comparison of the biological and cryoscopic ~~gamma~~⁵ determinations according to the specifications employed in Bitterfeld. The above methods, in addition to the polarographic method, have proven feasible but, in their current form, have recognized faults and give rise to values which can not always be reproduced exactly. The causes of these faults will be determined and the methods improved accordingly. This will be a joint project with BZA (Biologische Zentral Anstalt), Fahlberg-List, Fettchemie, Schering and Wolfen with the objective of coordinated reporting. Appropriations: 15,000 DME.
26. The development of dusting agents having a hexachlorocyclohexane basis, which can be placed in and upon the soil, is contemplated for the control of soil pests. Experiments concerning the selection of carriers and particle size, the content of the active agent and its purity will be performed. In addition, research on the development of a powder for the protection of crops against soil pests is contemplated. Appropriations: 25,000 DME.
27. Development of a transportable compressor apparatus for the generation of active-agent aerosols for insect control in the open field. The equipment for horse- and tractor-drawn vehicles will be developed for the generation of ~~a spray~~ of suspendible sulphur contact-insecticide using compressed air (at 5 atmospheres pressure). The fluid will be dispersed by a special injector-type jet at the end of a rotatable exhaust tube to permit spraying in any desired direction. The principles involved will be tested with the experimental equipment. Two experimental units, to serve as prototypes for series manufacture, will be developed and constructed. The main Department of Forestry in the Ministry for Agriculture and Forestry is greatly interested in the production of a usable apparatus for the generation of a genuine effective-agent cloud by early 1953. An experimental unit has already been built, on order of the Electrochemical Combine, Bitterfeld, by Engineer (fnu) Piepenburg, Leipzig N 22, Stoffenstrasse 21, and since early 1952 has been tested successfully in the various forests of the DDR for insect control (experts of the BZA, the Forestry Colleges of Eberswalde and Tharandt, and the Forestry Service were present). Expert's reports are available if desired. Appropriation: 15,000 DME.

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28. Manufacture of alumina out of domestic clays by treatment with hydrochloric acid; final technological work on the combined Bitterfeld procedures including treatment of ignited clay with hydrochloric acid, evaporation of the chloride solution to a solid salt, splitting of the hexahydrate into raw alumina and hydrochloric acid, igniting the raw alumina with sodium sulphate and coke (Peniakoff) to obtain sulphur dioxide, refining of the sodium aluminate to pure alumina and crystalline soda and operation of the semi-technical experimental unit for the compilation of data to be used in the construction of a plant with a capacity of 30,000 tons per year. The Specketer method will be further developed. The hexahydrate, separated from the concentrated chloride solution, is washed with concentrated hydrochloric acid and the pure salt $AlCl_3 \cdot 6H_2O$ is then thermally split into pure alumina and hydrochloric acid. Semi-technical experiments on the application of the method and determination of the properties of the pure alumina will be conducted. Appropriation: 1,260,000 DME.
29. Obtaining anhydrous magnesium chloride from magnesium chloride liquor. Studies will be conducted on the dehydration of the liquor by a step-wise evaporation of the hexahydrate and the dihydrate, followed by a dehydration of the dihydrate in a stream of hydrochloric acid gas. The objective of the work is the technical solution of the evaporation and dehydration of the dihydrate using circulated gaseous hydrochloric acid in spray dryers. All work will be done on a semi-technical scale under the direction of the Central Office for Research and Development in cooperation with the State Secretary for Chemistry (Staatsssekretariat fuer Chemie, Steine und Erden). Appropriation: 1,260,000 DME.
30. Manufacture of fluorine by the electrolysis of $KF-HF$ melts and the manufacture of perfluorinated hydrocarbons by the electrolysis of these compounds in anhydrous hydrogen fluoride; development of an electrolytic cell of 1000 ampere capacity to obtain 0.7 kilograms of fluorine per hour; testing of construction materials, particularly electrodes and insulation; development of an electrolytic cell for the direct fluorination of organic materials dissolved in the electrolyte (anhydrous HF) rather than for the production of fluorine as such. Electrode capacity of the cell will be about 30-100 amperes. Appropriation: 100,000 DME.
31. Production of tantalum metal powder through the manufacture of pure Ta_2O_5 out of a raw tantalum-niobium-titanium carbide and electrolysis of the potassium tantalum fluoride. The raw carbide, isolated from an iron-niobium-tantalum-titanium preliminary alloy (of which 200 tons are available), will be chlorinated and the technically pure mixture of $TaCl_5$ and $NbCl_5$ separated by solution in HF and fractional crystallization of the potassium double fluorides. The powdered tantalum is obtained from the electrolytic melt of K_2TaF_6 . A small technical apparatus for the production of K_2TaF_6 and its electrolysis will be constructed. Appropriation: 60,000 DME.
32. Systematic studies on application of the turbulence method (Wirbelschichtverfahren) employed in rotary kiln processes; construction of a semi-technical apparatus for systematic work on the application and suitability of the turbulence method for everything utilizing rotary kiln processes, especially at Bitterfeld. The work will be done under a directive of ZAPT and coordinated with the Staatssekretariat fuer Chemie, Steine und Erden. Appropriation: 100,000 DME.
33. Erection of an experimental technical installation for the production of basic lead montanate (sic) and lead oxyfluoride. The method for the manufacture of these stabilizers has been developed and the necessary apparatus is available. Construction development must be carried out for the erection of units with a capacity of about 300 kilograms of lead montanate and lead oxyfluoride. Appropriation: 15,000 DME.

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34. Development of a method for the flame-spraying of polyvinyl chloride. Coatings of PVC itself, or in the form of a suspension with a plasticizer of some other non-swelling liquid, on metals or other bases at elevated temperatures in accordance with other flame-spraying techniques, will be investigated. The project will be coordinated with HV Chemie. Appropriation: 60,000 DME.
35. Further exploration of PVC processing. The processing of Vinidur and PVC-plastics by the application of necessary heat will be converted largely to the modern heat sources of high frequency and infra-red radiations. The objective of this work is not only to find a more economical process, but also to develop new processing techniques with the aid of high frequency and infra-red heating. Appropriation: 30,000 DME.
36. Continuous pressure fractionation of the crude product obtained in the manufacture of methylene chloride which contains about 5-10 percent dissolved methyl chloride. Upon fractionation without a positive pressure, the methyl chloride escapes and carries with it a part of the methylene chloride. Moreover, the separation is not entirely successful because the methylene chloride thus obtained is contaminated with methyl chloride. On the other hand, a smooth separation of the methyl chloride is possible by means of a pressure fractionation at 5-6 atmospheres whereby losses of both products are minimized. The advantage of continuous fractionation is that the same capacity obtained by discontinuous separation can also be obtained from a smaller and cheaper installation and the equipment is easier to maintain. The planned capacity of the continuous fractionation unit is about 100 tons of methylene chloride per month. Appropriation: 50,000 DME.
37. Manufacture of carbon tetrachloride from methyl chloride and methyl alcohol. At the present time carbon tetrachloride is produced in the DDR from carbon disulfide. A reduction in cost should be realized through production of carbon tetrachloride out of methyl chloride obtained from methanol and hydrogen chloride. In the near future methyl chloride, in large quantities, will become available as a by-product in the manufacture of terylene fiber and a method for the utilization of this material must be found. The capacity of the experimental unit will be 10-20 tons of carbon tetrachloride per month. It is expected that, with minor alterations, the experimental unit for the manufacture of methylene chloride can be used. This should involve only a change in catalysts and reaction conditions. The work will be performed on orders of the SAG. Appropriation: 40,000 DME.
38. Erection of an experimental unit for the production of triethylhexyl phosphate. The method for the production of this phosphate has been developed on a laboratory scale and should be developed further on an experimental technical scale in order to produce 25 tons per month. Details of the design of the necessary apparatus and equipment can be provided. A satisfactory plan for the erection of the unit will be finished and checked by the end of the year to determine which necessary apparatus is on hand and which additional items must be procured. Concurrently, the funds required for the erection of the unit will be determined. Appropriation: 100,000 DME.
39. Production of 95-100 percent hexachlorocyclohexane in an experimental unit with a capacity of 500 kilograms per month. At the present time only an 80-85 percent product is produced in the DDR but the 95-100 percent product is required for many purposes. Furthermore, only the 95-100 percent product is exportable on the world market. A pilot scale crystallization unit, which will work semi-continuously, is needed for a trial of the procedure already worked out in the laboratory. The new method is expected to be even more economical than the production of the 80-85 percent hexachlorocyclohexane. The project will be coordinated with RAFT and HV Chemie. Appropriation: 30,000 DME.
40. Reduction of loss of benzene in the production of hexachlorocyclohexane. By the separation of the neutralization of the raw chlorination products from

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the distillation, and the use of strong agitation during the distillation, the loss of benzene has been reduced by one-half in laboratory experiments. In addition, the yield of the gamma hexachlorocyclohexane has been increased. The project will be coordinated with ZAFT and HV Chemie. Appropriation: 50,000 DME.

41. Development of new types of enamels; manufacture of thin-layer enamels with a titanium dioxide basis; enamels for light metals; casting enamels with a titanium dioxide basis; adhesion problems of sheet metal enamels; laboratory and pilot scale experiments. ~~THE~~ SANAR-Dessau, MEWA-Zwickau and Eisenhuettenwerk-Thale, all as wholesale customers, are greatly interested in this development. Appropriation: 40,000 DME.
42. Manufacture of activated silica from phosphorus furnace slags through further pressure and temperature treatments of the silicadioxide; examination of the application of such activated silicas to catalytic purposes; laboratory and pilot scale experiments. Appropriation: 60,000 DME.
43. Further development and improvement of methods for the digestion of titanium dioxide minerals with hydrochloric acid; improvement of yield in the digestion and quality of the titanium dioxide produced; development of new types of pigments and plant experiments. Appropriation: 60,000 DME.
44. Further development of acid-proof cements; experimental production of these cements to give impermeable joints; practical testing of the experimental mixtures produced and stock-piling of suitable raw materials. Appropriation: 20,000 DME.
45. Development and testing of rivet alloys of light metal basis. In the construction of ships and large equipment such as elevators and cranes, more and more light metals are being employed, necessitating the riveting of thick plates. Aluminum alloys, suitable for the manufacture of rivets, must be developed. These alloys must have the required strength and corrosion properties. Laboratory and pilot scale experiments, as well as strength, corrosion and similar tests, will be performed. This project will be coordinated with the Ministerium fuer Erzebergbau und Huettenwesen, Abteilung Forschung und Technik (Ministry for Ore Mining and Metallurgy, Department of Research and Technique). Appropriation: 24,000 DME.
46. Clarification of the relationships between final forming, trace elements and cold drawing on the conductivity of pure aluminum; plant trials with various starting materials to establish the optimal conditions regarding composition and type of working (temperature) of the pure aluminum to produce a conducting aluminum. Appropriation: 24,000 DME.
47. Testing of effective-agent aerosols for insect control (continuation of a previously existing research project). Experience has shown that fog-dispersed agents are highly effective because they act upon the insects without the use of a carrier material. Previous research and numerous tests in forests have indicated that GAMMA- and DDT-containing dispersing liquids are effective materials. Application to fruit trees and timber stands will be explored. For application to enclosed areas, ~~pyrotechnic~~ fumigants, atomized through careful treatment of the effective agent at the lowest possible burning temperature, will be tested. The project will be coordinated with ZAFT and HV Chemie. Appropriation: 30,000 DME.
48. Development work and application of thermoplastics such as PVC with the objective of substituting for non-ferrous metals and alloy steels in technological and household applications; research on suitable molding ~~techniques~~ and establishment of the methodology. The proper material processing techniques will be found through research and practice. Also the durability of PVC products, compared with the metal counterpart, will be tested. Appropriation: 60,000 DME.

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49. Continuation of work on the improvement of the quality of Igarite materials and on the expansion of the possibilities for use of Igarite as molded inserts for construction and technical process equipment. The purpose is to achieve better resistance to acids and bases and the effects of higher temperatures; improvement of the tempering process and extension of applications through the construction of various technical apparatus. Appropriation: 60,000 DME.
50. Studies on the production of chloral by continuous chlorination of ethyl alcohol in a special apparatus made of Igarite. To date, the chlorination of alcohol has been discontinuous because large chlorination vessels are required. Moreover, an average of seven days is required for the chlorination. For continuous production and shortening of the chlorination period, an apparatus of the bubble-cap column type, provided with cooling cells, should be constructed. Igarite will be used for the construction material of this column. This project was suggested by Director Dr. (fnm) Heydar in order to improve chloral production at the Electrochemical Combine, Bitterfeld. The project will be coordinated with Pettechemie and FMA-Werk. Appropriation: 60,000 DME.
51. Laboratory experiments to improve the procedure for the manufacture of gamma hexachlorocyclohexane. The objective is to improve the yield of the gamma isomer which is currently running 10-15 percent. In this manner, a significant cost reduction can be attained. The project will be coordinated with IAFI and HV Chemie. Appropriation: 90,000 DME.

1. Comment. Kola apatite is a natural phosphate mineral.
2. Comment. "Nitrophos" is a mixed synthetic fertiliser.
3. Comment. A polymer of trifluorochlorethylene produced by Farbwerke Hoechst AG, Frankfurt am Main.
4. Comment. PVC normally contains about 57 percent chlorine.
5. Comment. The gamma geometric isomer of hexachlorocyclohexane is the most physiologically active form of the compound.
6. Comment. Formula as given It is, correctly, K₂TaF₇ (or 2KF.TaF₅).

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